US 20080230041A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2008/0230041 A1

(43) Pub. Date: Sep. 25, 2008

Brusslar et al.

(54) **HIGH EFFICIENCY ALCOHOL FUEL ENGINE**

(76) Inventors: **Matthew J. Brusslar**, South Lyon, MI (US); **Charles L. Gray**, Pinckney, MI (US); **David James Haugen**, Ann Arbor, MI (US)

Correspondence Address:
David Read
US EPA, NVFEL
2565 Plymouth Rd.
Ann Arbor, MI 48105 (US)

(21) Appl. No.: **12/077,378**

(22) Filed: **Mar. 19, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/919,251, filed on Mar. 21, 2007.

Publication Classification

(51) **Int. Cl.**
F02B 13/00 (2006.01)

(52) **U.S. Cl.** **123/575**; 60/299; 123/568.11

(57) **ABSTRACT**

In an internal combustion engine adapted to combust alcohol blend fuels (i.e., fuels containing greater than 20% alcohol by volume), a dilute combustion mixture (e.g., with substantial EGR), intake air cooling, and latent cooling caused by vaporization of the alcohol fuel, are used together with a compact combustion chamber (in which the distance between the spark plug tip and furthest point of the combustion chamber is less than one-half the cylinder bore diameter) and controlled spark retardation to enable the use of a high compression ratio (greater than 15:1), for improved efficiency without triggering auto-ignition. Thermal brake efficiency significantly exceeds that for conventional gasoline engines, thereby improving the potential cost-effectiveness of alcohol fuels. Stoichiometric operation is used for optimal emissions control.